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Appraisal

Critically Appraised Papers

Exercise training decreases fasting insulin levels and improves insulin resistance in children and adolescents

Summary

Summary of: Fedewa MV, Gist NH, Evans EM, Dishman RK. Exercise and insulin resistance in youth: A meta-analysis. *Pediatrics* 2013;133:e163-e174.

Objective: To review the evidence as to whether exercise training improves fasting insulin and insulin resistance in children and adolescents. ***Data Sources:*** PubMed, SPORTDiscus, Physical Education Index, Web of Science, searched up to June, 2013. This search was supplemented by review of the reference lists from retrieved articles. ***Study Selection:*** Randomised controlled trials involving healthy children or adolescents in which exercise training was compared to a non-exercise comparison. Outcome measures were fasting insulin and insulin resistance. ***Data Extraction:*** Two reviewers extracted data, and discrepancies were resolved by discussion. Methodological quality was not assessed. ***Data Synthesis:*** Of the 546 studies initially identified by the search, 24 studies, with a total of 1599 participants, met the selection criteria and were included in the review. Based on the quantitative pooling of the available data from these trials, exercise training reduced fasting insulin levels in children and adolescents significantly more than the non-exercise comparison group with a mean effect size of 0.48 (95% CI 0.22 to 0.74). Exercise training was also more effective in reducing insulin resistance than the comparison group with a mean effect size of 0.31 (95% CI 0.06 to 0.56). The results were consistent across gender, age and ethnicity. Body mass index moderated the effect of exercise on fasting insulin, that is: a greater effect was observed in children and adolescents with higher body mass index. Each of the exercise interventions varied in design and included aerobic, resistance, a combination of training modes, games and play. When reported, exercise training consisted of 3 (SD 1) sessions per week, for 53 (SD 20) minutes at a moderate to vigorous intensity of physical activity per session, for 16 (SD 11) weeks. ***Conclusion:*** Exercise is effective in decreasing fasting insulin and improving insulin resistance in healthy children and adolescents. Regular physical activity and exercise training should be included in programs for children and adolescents at risk of developing type II diabetes.

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Commentary

Whilst the prevalence of obesity and type 2 diabetes mellitus is increasing, the relationship between these two conditions varies worldwide.[1] Other factors, such as differences in sugar availability, explain variations in diabetes rates that are not explained by physical activity, being overweight or obese. Therefore, underlying metabolic abnormalities and, in particular, insulin resistance are more closely associated with type 2 diabetes mellitus rather than being indices of obesity.

Fedewa et al. show that regular exercise in youth reduces insulin resistance, especially in those with greater insulin resistance (generally those who are more obese and older). These data confirm the importance of physical activity and exercise to health in younger populations. This is relevant to later life, as those with greater insulin resistance in childhood and adolescence have greater insulin resistance in adulthood and are therefore predisposed to health problems, including: type 2 diabetes mellitus, hypertension, coronary artery disease, malignancy and stroke. Thus, reducing insulin resistance during childhood and adolescence may result in long-term improvement in health outcomes.

This review generically describes exercise interventions and only provides broad guidelines on three critical issues: what type of exercise is ideal; what exercise intensity should be prescribed; and what frequency of exercise is needed? Data from mainly adult studies show that both aerobic and resistance training exercise reduce insulin resistance and that moderate-to-vigorous-intensity exercise is associated with greater metabolic benefit compared to low-intensity exercise.[2] However, the effect of exercise on insulin resistance begins to wane 48 hours after a bout of exercise. Thus, to maximise metabolic effect, exercise needs to be regular and ideally performed on most days. The chosen mode of exercise may come down to an individual's preference and which type of exercise they are more likely to adhere to. If exercise can be made satisfying and enjoyable it will most likely lead to better compliance and health outcomes.

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